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AUTHOR Peghali, Issa
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ABSTRACT

A previous study had confirmed that a substantial number of low achievers in grades 5 through 8 had high algorithmic confidence in each of the four arithmetic operations with whole numbers. The purpose of the present study was to follow up the results through interviewing low achievement-high confidence students in order to ascertain if they believed in their high confidence and to discover their reason(s). The test used in the previous study was administered to all 126 students in grades 5, 6, and 7 of one school and 19 students were selected to be interviewed personally. The interview consisted of re-administering of the confidence test on all four operations and retesting, as well as questioning each subject on some of the items of an operation in which he was high in confidence, but low in achievement. Results showed that the confidence test appeared to give a consistent measure of the students' confidence. Students interviewed did believe in their high confidence. The report closes with a list of ten reasons given by students for their high confidence. (DT)

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MEDIC

INTERVIEWS WITH STUDENTS OF HIGH CONFIDENCE AND LOW ACHIEVEMENT IN WHOLE NUMBER COMPUTATION REPORT NO. 5-76

FACULTY OF EDUCATION
THE UNIVERSITY OF BRITISH COLUMBIA
2075 WESBROOK PLACE
VANCOUVER, B.C., CANADA
V6T 1W5

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SE 021 338

MEDIC REPORTS 5-76

Interviews with Students of High Confidence and Low Achievement

by
Issa Feghali

Report from the
Richmond Project (ORACLE)

David F. Robitaille, Principal Investigator

Mathematics Education Diagnostic and Instructional Centre
Department of Mathematics Education
University of British Columbia
Vancouver, B.C.
V6T 1W5

BACKGROUND: RICHMOND PROJECT (1975):

Many students who were referred to the Mathematics Education Diagnostic and Instructional Center (MEDIC) at the University of British Columbia for remediation were confident that their methods of performing the four operations - addition, subtraction, multiplication and division - were correct while their achievement was low. There was a need to study the relationship between a student's algorithmic confidence in performing the four operations and his achievement; it was felt that remediation could be hindered if low achievers had high confidence in their incorrect method.

Five thousand seven hundred students in grades 5 through 8 in Richmond School District were tested; 5440 responses were used. The test (see Appendix I) consisted of two parts. In the first part the students expressed their degree of confidence in performing addition, subtraction, multiplication and division while in the second part they worked out items of these four operations; the subtest dealing with division contained 8 items, whereas each of the other three contained 12 items. It was confirmed that a substantial number of low achievers in grades 5 through 8 had high algorithmic confidence in each of the arithmetic operations - addition, subtraction, multiplication, and division (for more details about Richmond experiment and results see MEDIC Report #4).

PURPOSE OF THE PRESENT PROJECT:

Many attempts have been made to explain the reason(s) for the high confidence in the low achievers. However, the purpose of the present project has been to interview low achievement-high confidence students in order to ascertain whether or not they really believe in their high confidence and to discover, if possible, their reason(s) behind it.

METHOD:

On March 17, 1976 all 126 students in grades 5, 6, and 7 at Bayview Comprehensive Community School in Vancouver were administered the test (see Appendix I) used in the Richmond project. A breakdown of the number of students by grade and by sex is shown in Table 1.

TABLE I
Number of Students Tested

Grade	Boys	Girls	Total
5	16	17	33
6	20	24	44
7	22	27	49
Total	58	68	126

Both the confidence and performance parts of the test were administered to the students by the author. No time limit was imposed but most students finished the test in 25-35 minutes.

Nineteen students (15.1% of those tested) were selected to be interviewed. The selection was based on the following two criteria: 1) each subject selected was "positive" his method of performing at least one of the four basic operations was correct and 2) each subject selected had three or more incorrect answers in the performance section of the test for the corresponding operation(s).

The comparison of confidence choices and the number of mistakes in the various operations made by each of these 19 students is presented in Table II.

The letters under the confidence choices in Table II refer to the degree of confidence, in the four operations, chosen by the subjects. "a" referred to being positive that their way was correct, "b" to being pretty sure that their way was correct, "c" to not knowing whether their way was correct or not, "d" to being pretty sure that their way was wrong and "e" to being "positive" that their way was wrong.

TABLE II

A Comparison Between the Confidence Choices and the Number of Mistakes

Subject Number	Grade	Sex	Confidence Choices +	−	x	÷	Number of Mistakes +	−	x	÷
1	5	M	b	a	a	b	3	8	11	8
2	5	M	b	a	b	a	0	7	4	4
3	5	M	a	b	a	b	1	5	3	2
4	5	M	a	a	b	b	1	4	4	4
5	5	F	a	b	a	b	1	1	4	Not attempted
6	6	F	a	a	a	a	1	0	3	5
7	6	M	a	a	b	a	2	3	7	3
8	6	M	a	a	b	a	1	0	4	3
9	6	M	a	a	a	a	1	1	0	6
10	6	F	a	a	b	a	2	1	3	4
11	6	F	a	a	a	b	2	3	3	6
12	6	M	b	b	a	b	3	0	3	4
13	6	M	a	a	a	c	1	1	4	Not attempted
14	7	F	a	b	a	b	1	10	7	8
15	7	F	a	a	a	a	0	2	1	5
16	7	F	b	b	a	b	2	0	6	6
17	7	F	a	a	a	b	1	3	1	4
18	7	M	b	a	a	b	1	4	2	4
19	7	M	a	a	a	b	0	3	1	4

Personal interviews were conducted on April 24, 1976, a week after the testing; audio taped protocol was made for each interview. Each interview consisted of two main parts, the re-administering of the confidence test on all four operations and retesting, as well as questioning each subject on some items of an operation in which he was high in confidence and low in achievement. A comparison between the confidence choices on the test and in the interview is presented in Table III. The operation that was the topic of the interview is also presented in Table III. Subjects number 5 and 13 did not attempt the division section on the first test and therefore Table III does not show their score for division.

TABLE III

A Comparison Between the Confidence Choices on the Test and in the Interview; the Operation that was the Topic of the Interview

Subject Number	Grade	Sex	Confidence in the Test +	-	x	÷	Number of Mistakes +	-	x	÷	Confidence in the Interview +	-	x	÷	Operation Chosen for the Interview
1	5	M	b	a	a	b	3	8	11	8	Absent				Subtraction
2	5	M	b	a	b	a	0	7	4	4	a	b	b	a	Subtraction
3	5	M	a	b	a	b	1	5	3	2	a	a	a	b	Multiplication
4	5	M	a	a	b	b	1	4	4	4	a	a	b	b	Subtraction
5	5	F	a	b	a	b	1	1	4	-	a	a	b	b	Multiplication
6	6	F	a	a	a	a	1	0	3	5	a	a	a	a	Division
7	6	M	a	a	b	a	2	3	7	3	a	a	c	a	Division
8	6	M	a	a	b	a	1	0	4	3	a	b	b	a	Division
9	6	M	a	a	a	a	1	1	0	6	a	a	a	a	Division
10	6	F	a	a	b	a	2	1	3	4	a	a	b	b	Division
11	6	F	a	a	a	b	2	3	3	6	a	a	b	b	Subtraction
12	6	M	b	b	a	b	3	0	3	4	b	b	a	b	Multiplication
13	6	M	a	a	a	c	1	1	4	-	a	b	a	b	Multiplication
14	7	F	a	b	a	b	1	10	7	8	a	b	a	b	Multiplication
15	7	F	a	a	a	a	0	2	1	5	a	a	a	b	Division
16	7	F	b	b	a	b	2	0	6	6	b	a	b	b	Multiplication
17	7	F	a	a	a	b	1	3	1	4	a	a	a	b	Subtraction
18	7	M	b	a	a	b	1	4	2	4	b	a	a	b	Subtraction
19	7	M	a	a	a	b	0	3	1	4	a	a	a	b	Subtraction

INTERVIEWS:

Without knowing the results of his previous test, each student was again given the confidence section. If his choices differed from those on the first test, the student was asked about the reasons that made him change his mind. Then, each student was retested on one operation in which he had high confidence and low achievement.

The retest began by giving the student an easy item and making sure he got the correct answer; the student was asked if he thought his way of doing the problem was correct and was told that his answer was correct. Sixteen students succeeded in getting the first item correct while the other two students did not; these two were given an easier item in which they succeeded in getting the correct answer.

Each student was later given 2 or 3 other items of ascending order of difficulty and asked whether or not he performed each of them the correct way. Also, after each (or all) of the items the student was questioned about his criteria for determining the degree of his confidence.

The following is a typical ordered list of questions and answers to illustrate how the interviews were conducted; except when noted by "paraphrased" all answers are actual quotations.

Q 1. JOHN,* YOU SAID LAST TIME THAT YOU WERE POSITIVE THAT YOUR WAY OF MULTIPLYING** WAS CORRECT: TODAY YOU ARE SAYING THAT YOU ARE PRETTY SURE THAT YOUR WAY IS CORRECT. HOW COME YOU CHANGED YOUR MIND? WHAT MADE YOU CHANGE YOUR MIND? (There are 10 answers to Q 1 since 10 students were not consistent in their confidence choices.)

A1. 1. ...I was positive that my way was correct but then we had a test and I'm not that good in multiplication, so I think that I'm pretty sure that my way is correct.

A1. 2. (Paraphrased)...after I took the test I decided what to put today.

* John will serve as the pseudonym for each subject.
** Multiplying can be replaced by adding, subtracting or dividing.

A1. 3. ...because now (in class) I'm getting quite a few wrong.

A1. 4. ...I had time to think about it and I'm not quite sure, I'm almost positive.

A1. 5. ...I don't know...it's hard to say...

A1. 6. (First test choice: Pretty sure; second test choice: Positive)
...I haven't got anything wrong during the multiplication lately....

A1. 7. Because I haven't been doing too good in multiplication....

A1. 8. ...I'm pretty sure that my way is correct...but I'm not sure (positive)
....

A1. 9. ...I wasn't quite sure last time and I'd pick this one today.

A1.10. I don't know...I'm pretty sure that my way is correct....

Q 2. JOHN, DO YOU THINK YOU DID THIS THE CORRECT WAY? (This question was repeated after each of the items.)

A2. 1. Yes
I'm not sure.
Yes,...yes I think I did it correct.

A2. 2. Yes
Yes, I'm pretty sure
No, not really! I'm not really sure.

A2. 3. Yes.
It is wrong....
It is right.
It is wrong.

A2. 4. Pretty sure.
Yes...I'm not positive, I'm pretty sure.
Yes.
Yes.

A2. 5. ...I don't know which way is correct! ...yes (correct).
Yes, but it is probably wrong though.
Yes.

A2. 6. Yes
Yes, ...I'm pretty sure
I think so, ...pretty sure.

A2. 7. Yes, ...I'm positive I did it the right way.
I'm positive this is correct....
I'm pretty sure that's right.

A2. 8. Yes
Yes, ...I'm pretty sure.
I'm not quite sure (about the answer);...but sure the way is correct....

A2. 9. Yes,...between "a" and "b".
Yes...I think so...between "a" and "b".
...3/4 positive and 1/4 pretty sure;...4/5 positive and 1/5 pretty sure.

A2.10. Of course.
Yes,...pretty sure.
...I'm positive.

A2.11. Yes.
Yes,...I'm sure that I did it the correct way....
I think that this is the right way.

A2.12. I'm pretty sure,...that's the way I always do my dividing.
No, I don't think so,...I think that this is it,...but I am not sure....

A2.13. Yes...positive
Yes...I'm positive.
...I think I'm doing it right but I'm not sure that the answer is right.

A2.14. Yes...I am positive.
Yes, I did it the same way I did this one.
Yes.

A2.15. ...Yes, I'm pretty sure.
Yes.
Yes....Pretty sure.
I'm not sure.

A2.16. Yes.
Yes,...I guess so
...Yes, I think so.

A2.17. Yes, I think so (between positive and pretty sure).
...I'm pretty sure.
...Pretty sure again.

A2.18. Yes...pretty sure.
Yes.
Yes.

Q 3. WHAT MAKES YOU SO SURE THAT YOUR WAY IS CORRECT? (There are only 15 answers to Q 3 because the first 3 subjects were not asked this question.)

A3. 1. I don't know...,I guess it's the way I learned...;I don't really know....

A3. 2. The mark (grade)...;if I find it easy or hard.

A3. 3. If I did the first question right, I know how to do the second question right...!

A3. 4. It usually works out,...the way I do it, I usually get the right answer...andI'm positive that my way is correct.

A3. 5. (In multiplication) I got 6 or 7 wrong out of 24...and this made me pretty sure that my way is correct.

(In subtraction)...on tests I do good enough...so I'm positive that my way is correct...I only get maybe 2 or 3 wrong out of 24.

A3. 6. Because I was taught this way...and I did this for a long time.

A3. 7. ...I don't know, the way I do it always works out...and most of the time it is correct....

A3. 8. I just think I know how to do division.

A3. 9. It's the only way you can divide...from a lot of teachers I've known that....

A3.10. I know I do it the right way because that's the way I was taught.

A3.11. Because I know how to multiply....

A3.12. Because usually I got the answers right (7 out of 10 makes him pretty sure)...I'm almost positive but I always make mistakes when I'm doing it. But I know that my way of dividing is correct.

A3.13. I don't know.

A3.14. (No relevant answer; the same subject elaborated later in A4.1.)

A3.15. ...my teachers taught me how to do it...this way.

Q 4 WHAT DOES MAKE YOU "POSITIVE" OR "PRETTY SURE" OR...THAT YOUR WAY IS CORRECT? IS IT BECAUSE THE ANSWERS YOU GET OR SOMEBODY TOLD YOU THAT YOUR WAY IS CORRECT OR WHAT? (Q 4. was asked when Q 3 was not answered satisfactorily.)

A4. 1. I've been taught...and I see lots of people (students) do it... and I get it right in my book.... It is not (only) the answer that tells me...it's what I see...(students, teachers, books).

A4. 2. I have a feeling that it's correct. (Paraphrased) This feeling is based on the first question and if the first one was wrong then the following might be right.

A4. 3. Sometimes I work in groups and with my teacher...I do the questions and I find out that I am doing it right.

A4. 4. (Paraphrased) Because teachers approve it and it is in the book.

A4. 5. I don't know, I just have a feeling that it is right...(although she's correct only 50% of the time).

RESULTS AND CONCLUSIONS:

Eight out of 18 students made exactly the same choices on the confidence test sections of both the first and the second test (see Table III). Six students made 3 of the choices exactly the same on both tests and made the fourth choice one degree less on the second test than on the first test. The rest of the 4 students made 2 of the choices exactly the same on both tests, the third choice one degree less and the fourth choice one degree more on the second test than on the first test. These results are summarized in Table IV.

TABLE IV.

Number of students with Respect to their Confidence Consistency

Consistent in All Four Choices	Consistent in 3 Choices 4th Choice: One Degree Less	Consistent in 2 Choices: 3rd Choice: One Degree Less 4th Choice: One Degree More	Total
8	6	4	18

Thirteen students out of 18 were consistent in their confidence choices on the operation chosen for the interview and the rest of 5 students made a choice of one degree less on the second test than on the first test. This result is shown in Table V.

TABLE V.

Number of Students with Respect to their Confidence Consistency on the Operation Chosen for the Interview

Consistent	Not Consistent: Down One Degree	Total
13	5	18

It appears that the confidence test gave consistent measure of the students' confidence in grades 5 through 7.

This project showed that some low achievers have very high confidence. This is consistent with the results of the Richmond Project and some of the remediation cases referred to MEDIC at the University of British Columbia.

It seems that the students interviewed really believed in their high confidence; their choices were not arbitrary or fake but real and chosen carefully.

Studies of the audio taped interviews and analysis of the students' responses showed that there are many reasons for the high confidence of low achievers. Fifteen students were asked about the reason(s) for their high confidence ; two talked about a feeling that their way is correct; two told that their method usually works out and leads to the right answer; three said that most of their answers were correct; one said that some of his answers were correct; one judged upon the grades he got; five declared that they were using the method they were taught; four stated that teachers, other students and some books have the same method as theirs; two asserted that they have used this way for a long time; one indicated

that he just knew how to do it; one claimed that his way is the only correct one. These results are summarized in Table VI.

TABLE VI.

Number of Students with Respect to their Reasons for High Confidence - Low Achievement

Feeling	Method Usually Works Out	Most Answers Correct	Some Answers Correct	Mark or Grade	Taught in a Certain Way	Methods of Teachers Students Books	A Long Time Habit	Just Know How	It's the Only Way
2	2	3	1	1	5	4	2	1	1

The total number of reasons exceeded the number of the students asked because some students indicated more than one reason for their high confidence.

Appendix I

12

NAME: _____ GRADE: _____ DIVISION: _____

SCHOOL: _____

AGE: _____ DATE OF BIRTH: _____ BOY GIRL (circle one)

For each question, put an X through one of the letters a, b, c, d, or e.

1. How sure are you that your way of ADDING is correct?
   (a) I'm positive that my way is correct.
   (b) I'm pretty sure that my way is correct.
   (c) I don't know if my way is correct or not.
   (d) I'm pretty sure my way is wrong.
   (e) I'm positive my way is wrong.

2. How sure are you that your way of SUBTRACTING is correct?
   (a) I'm positive that my way is correct.
   (b) I'm pretty sure that my way is correct.
   (c) I don't know if my way is correct or not.
   (d) I'm pretty sure that my way is wrong.
   (e) I'm positive that my way is wrong.

3. How sure are you that your way of MULTIPLYING is correct?
   (a) I'm positive that my way is correct.
   (b) I'm pretty sure that my way is correct.
   (c) I don't know if my way is correct or not.
   (d) I'm pretty sure that my way is wrong.
   (e) I'm positive that my way is wrong.

4. How sure are you that your way of DIVIDING is correct?
   (a) I'm positive that my way is correct.
   (b) I'm pretty sure that my way is correct.
   (c) I don't know if my way is correct or not.
   (d) I'm pretty sure that my way is wrong.
   (e) I'm positive that my way is wrong.

ADDITION

(Show all your work in the space provided.)

a.

$$\begin{array}{r} 8 \\ 7 \\ 3 \\ 8 \\ +\ 9 \\ \hline \end{array}$$

b. $4 + 7 + 1 + 2 = _____$

c.

$$\begin{array}{r} 754 \\ +\ 567 \\ \hline \end{array}$$

d.

$$\begin{array}{r} 12 \\ 31 \\ 91 \\ +\ 74 \\ \hline \end{array}$$

e.

$$\begin{array}{r} 6 \\ 1 \\ 0 \\ \hline \end{array}$$

f. $307 + 48 + 596 + 6 = _____$

g.

$$\begin{array}{r} 37 \\ 45 \\ +90 \\ \hline \end{array}$$

h. $5 + 7 + 0 + 4 = _____$

i.

$$\begin{array}{r} 240 \\ 886 \\ 359 \\ +\ 794 \\ \hline \end{array}$$

j.

$$\begin{array}{r} 2 \\ 1 \\ 2 \\ 0 \\ +\ 1 \\ \hline \end{array}$$

k.

$$\begin{array}{r} 4 \\ 9 \\ 6 \\ 1 \\ +\ 1 \\ \hline \end{array}$$

l. $73 + 59 + 7 = _____$

SUBTRACTION

(Show all your work in the space provided.)

a. 23007 - 9739	b. 7749 - 7340	c. 482 - 137	d. 4003 - 2177
e. 570 - 97 = _____	f. 6004 - 1705	g. 7044 - 2129	h. 5047 - 2036
i. 1163 1079	j. 5400 - 2138 = _____	k. 5216 - 477 = _____	l. 1714 - 311 = _____

MULTIPLICATION

(Show all your work in the space provided.)

541 x409	b. 2071 x 368	c. 62 x 4	d. 403 x 59
589 x 7	f. 408 x 9	g. 27 x104	h. 230 x 2
67 x60	j. 221 x 4	k. 1203 x 3	l. 313 x 71

DIVISION

(Show all your work in the space provided.)

a. $6\overline{)429}$	b. $4\overline{)1761}$	c. $53\overline{)32184}$	d. $47\overline{)2662}$
e. $27\overline{)1242}$	f. $5\overline{)7005}$	g. $28\overline{)25396}$	h. $9\overline{)4563}$